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ABSTRACT

Society has become increasingly aware of the harmful effects that the disposal of chemical waste products have on the environment and human health. Public information is central to the development of a responsible waste management plan. The activities contained in this guide are organized in sequence from kindergarten to grade 12, and provide teachers with a selection of activities to help increase their students' awareness of the problems associated with hazardous wastes. Topics range from acquainting students with waste management issues such as trash, litter and recycling principles, to examining waste disposal technologies and exploring complex, interdisciplinary social issues. Each of the 27 activities includes the purpose of the activity, references, a list of materials, procedures, and the source of the activity. (CW)

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HAZARDOUS WASTE ENVIRONMENTAL EDUCATION RESOURCE KIT FOR MANITOBA TEACHERS:

SUGGESTED ACTIVITIES K-12

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Manitoba Hazardous Waste Management Corporation

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HAZARDOUS WASTE ENVIRONMENTAL EDUCATION RESOURCE KIT FOR MANITOBA TEACHERS:

SUGGESTED ACTIVITIES K-12

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May, 1989

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Preface

This report has been prepared by the Manitoba Hazardous Waste Management Corporation (MHWMC), to support the need for environmental education on waste management issues in the province.

Although the activities contained in this Educational Resource Kit have been extracted from reputable sources, the MHWMC does not:

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This document has been reviewed by Manitoba Education and the MHWMC has been granted authorization for its distribution.

May, 1989

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Introduction

During the past decade, society has become increasingly aware of the harmful effects that the improper disposal of 'chemical revolution' waste products have on the environment and human health.

In Manitoba, approximately 20,000 tonnes of hazardous waste is generated per year, which requires proper treatment and disposal. As industry, the agricultural sector and consumers become more dependant on chemicals, this figure will likely grow in the future. Similarly, greater regulation, public awareness and clean-up of past practices will increase the quantity of these wastes.

Although the all too common practice of dumping hazardous wastes in Manitoba sewers or municipal landfills has not yet resulted in the extent of problems experienced in the industrialized regions of Canada and the U.S., the problems will not be held at bay indefinitely if we continue to disregard the environmental impacts.

In 1982, the province of Manitoba initiated a long term hazardous waste management program which included preliminary technical studies concerning hazardous waste management options, a regulatory framework to control these wastes and extensive public consultation through Clean Environment Commission hearings. The Manitoba Hazardous Waste Management Corporation was created as a result of this process and charged with the mandate to develop a waste management system for hazardous wastes in the province.

In August, 1987, the Corporation became operational and has since endeavored to provide an integrated approach to hazardous waste management. Apart from developing a waste treatment facility, the Corporation also provides waste volume reduction (e.g. recycling, reuse, reduction and recovery) services to large and small quantity generators and assists Manitoba communities to coordinate household hazardous waste collection depots in their area.

Public information is central to the development plan and the Hazardous Waste Environmental Education Resource Kit for Manitoba Teachers: Suggested Activities K-12 is one more undertaking that the Corporation has pursued to educate Manitobans about waste management issues.

Hazardous wastes range from solvents to paint residues, waste oils and materials containing highly toxic chemicals. **Radioactive and explosive wastes are also hazardous but they are regulated by the Federal Government and are not within the jurisdiction of provincial authorities.** Table 1 provides a sample of typical provincially regulated hazardous wastes according to dangerous goods classification including examples from industrial and domestic sources.

For further information, please contact the Manitoba Hazardous Waste Management Corporation at (204) 945 1844 in Winnipeg or 1-800-782-2474 **Toll Free** from points within Manitoba.

Table 1

Examples of Hazardous Wastes

Class	Examples
Compressed Gases	acetylene, propane, aerosols, carbon dioxide, any other waste compressed gases
Flammable Liquids	alcohols, spent solvents such as acetone, toluene, xylenes and paint thinner, waste gasoline, enamel paints and lacquers, some glues, liquid roof tars, solvent based cleaning solutions, solvent based inks, some still bottoms from solvent recovery
Flammable Solids	fire starter briquettes, alkali metals (NA, K, Li), alkaline earth metals (Ca, Mg), oily rags (spontaneously), some plastics, epoxy resins
Oxidizers	hydrogen peroxide, other peroxides, stabilized chlorine pool chemicals and bleach (hypochlorites), ammonium nitrate, fertilizers, inorganic nitrates and nitrites
Poisonous (Toxic) and Infectious	pesticides, heavy metals (Cr, Pb, Hg, Cd, etc.) arsenic compounds, cyanide compounds (including some plating waste), wood preservatives, some still bottoms from chlorinated solvent recovery, most organic and inorganic chemicals
Corrosive	acids and bases including many household and industrial cleaners, car battery fluids, ammonium hydroxide, chromic acid, muriatic acid, sodium hydroxide and many other inorganic and organic acids and bases
Environmental Toxicity	chemicals specifically listed as environmentally toxic such as some pesticides, PCB's, some dilute waste streams and sludges from industrial processes containing toxic components which when disposed of in large quantities present an environmental hazard

Note: For further reference, a comprehensive listing of over 3000 hazardous wastes can be found in the Dangerous Goods Handling and Transportation Act (Canada), adopted by Manitoba through Regulation 172/85. The MHWMC pamphlet What are Household Hazardous Wastes? also contains a table of common toxic household products and a selection of non-toxic alternatives (included in kit).

Special Instructions to Teachers

The activities contained in this resource kit are organized in sequence from Kindergarten to Grade 12, and provide teachers with a selection of exercises designed to educate students of all ages that "**We Are All Part of the Hazardous Waste Problem**". With topics which range from acquainting students with waste management issues such as trash, litter and recycling principles, to examining waste disposal technologies and exploring complex, interdisciplinary social issues, this guide provides modular activities which will appeal to all academic levels in a wide variety of subject areas.

Designed by teachers or educational consultants, the activities in this kit have been extracted from reputable sources. Although most of the activities have been adapted slightly to reflect current waste management philosophy and/or issues in Manitoba, the integrity of each exercise has been maintained.

It is important to note that hazardous waste management is highly technical and complex discipline and it may be futile to expect students to grasp numerous and sometimes confusing details in a short time span. Instead, encourage group discussion and brainstorming, and arrange for a follow-up visit from Corporate personnel, to discuss the questions and comments that may have arisen with your class. The objective should be to stimulate sensitivity and awareness of the issue.

When preparing for an activity, you are encouraged to obtain background information from the list of **Reference Material** or contact the Corporation if you require further assistance:

The Manitoba Hazardous Waste Management Corporation
226 - 530 Century Street
Winnipeg, MB
R3H 0Y4

Telephone:

(204) 945 1844 in Winnipeg

or

1-800-782-2474 Toll Free within Manitoba

Coding of
Hazardous Waste
Environmental Activities

Each of the following student activities in this Resource Kit have been given a unique Environmental Education Activity Number (EEACTNO), according to the following criteria:

Grade Levels:		Numeric Sequence:	Activity Descriptive:	
I:	K-3	1	G:	General
II:	4-6	2	R:	Recycling
III:	7-9	3	HW:	Hazardous Waste
IV:	10-12	4, etc.	A:	Advanced Concept

Additional Reference Material

The MHWMC Resource Centre

1. **General Information**

The Resource Centre of the Manitoba Hazardous Waste Management Corporation contains a special collection of technical, environmental, social and economic literature related to the rapidly evolving discipline of hazardous waste management, including journals, books, technical reports, government publications and video tapes.

The reading room is generally open to the public from Monday to Friday, 8:30 a.m. - 4:00 p.m., and most circulating non-reference material is available on loan for up to three weeks. The Resource Centre is unable to provide interlibrary loans, therefore, in-house use is recommended. Patrons are also advised to call in advance to ensure that staff are available to provide assistance when you visit.

2. **Audio-Visual Materials**

The MHWMC produced a videotape Who's Responsible? in 1988 to inform Manitobans about key hazardous waste issues and the need to develop an environmentally sound disposal system for the province. It is available free of charge, on VHS or Beta, and is 13 minutes in duration.

Other VHS tapes are available for loans up to 2 weeks duration through the MHWMC Resource Centre. Contact the Corporation for further details.

Documentary and Educational Tapes

PCB's: Are they harmful? 12:17. The Electric Power Research Institute.
Covering an Environmental Accident. 60:00. Rutgers University, New Jersey.
Poison and the Pentagon. 58:00. Produced for PBS Frontline Series; WGBH Education, Boston.
Hazardous Waste Management: Challenge of the Decade. The Federation of Ontario Naturalists.

Household Hazardous Waste Tapes

Beginning at Home Tackling Household Hazardous Wastes. 18:00. League of Woman Voters of Massachusetts.
Household Hazardous Waste "Everyone's Problem". 18:00. League of Woman Voters of Massachusetts.
Household Hazardous Waste. 10:00. State of Minnesota, Minnesota Pollution Control Agency, Solid and Hazardous Waste.

Promotional Tapes

A Vision Realized; An Achievement Recognized. Alberta Special Waste Management Corporation.
Our Throw-Away Society. 23:00. Alberta Special Waste Management Corporation.
Commercial Slide/Tape Transfer. Alberta Special Waste Management Corporation.
Industrial Waste: A Challenge We Must Meet. 13:00. Ontario Waste Management Corporation.

Department of Environment Resource Centre

The Resource Centre of the Manitoba Department of Environment also offers a selection of materials on hazardous waste management. The facility which is open to the pubic during the hours of 8:30 - 4:00 p.m., is located at:

Building 2, 139 Tuxedo Blvd
Winnipeg, MB

Telephone: 945 7125 or 945 7126

You are encouraged to call in advance.

Publications

The following group of publications are available from Manitoba Hazardous Waste Management Corporation (MHWMC) free of charge, to provide the teacher with background and technical information regarding the issue of hazardous waste management in the province of Manitoba.

To obtain copies, contact the MHWMC in Winnipeg at 945-1844 or **Toll Free** at 1-800-782-2474 from points within Manitoba. You may also submit a written request to:

226-530 Century Street
Winnipeg, MB
R3H 0Y4

MHWMC Pamphlets

Manitoba Hazardous Waste Management Corporation.
Hazardous Waste Generator Services Program.
What are Household Hazardous Wastes?
Que sont les ... dechets domestiques dangereux?
Site Selection Process.
Site Selection Criteria.

Provincial Government Pamphlets

Hazardous and Special Wastes. Planning Ahead.
Hazardous and Special Wastes. Looking to the Future.
Managing Hazardous Wastes.

MHWMC Reports

The Development of a Hazardous Waste Management System in Manitoba.
Report on the Site Selection Process and Public Response Through the November, 1988, Open Houses.

Provincial Government Agency Reports

Yee, E., Kucera, E. and Keleher, J.J. eds. 1985. Hazardous Waste Management in Manitoba. Manitoba Environment and Workplace Safety and Health.

Kucera, E. ed. 1988. Guide to Manitoba's Hazardous Waste Legislation. Hazardous Waste Program, Department of Environment and Workplace Safety and Health.

The Clean Environment Commission. May, 1987. The Clean Environment Commission Report on Public Hearings. Phase I - Stage II Manitoba Hazardous Waste Management Program. November 12, 1986 - January 20, 1987. Volume I and II.

MHWMC Discussion Documents

Proposed Site Selection Process for the Development of a Hazardous Waste Management System.

Proposed Site Selection Criteria for the Development of a Hazardous Waste Management System.

MHWMC Technical Documents

Reid Crowther & Partners Ltd. August, 1988. System Scope and Technology Study Part I - Strategy Review. Prepared for the Manitoba Hazardous Waste Management Corporation.

Reid Crowther & Partners Ltd. October, 1988. System Scope and Technology Study Part II - Technology Review. Prepared for the Manitoba Hazardous Waste Management Corporation.

Reid Crowther & Partners. January, 1989. System Scope and Technology Study Part III - Conceptual System Design. Prepared for the Manitoba Hazardous Waste Management Corporation.

EEACTNO: I-1-G **Level:** K-3 **Recommended Subject:** Language Arts

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Purpose: To help students realize that litter is every person's responsibility.

Reference: Cherie Lund and Chanelle Wolfe. Exploration with Garbage. Project ECO-logy. Highline Public Schools, Seattle, WA. Title III ESEA.

Activity: Provide each student with 30 x 45 cm manila paper and crayons. Instruct students to fold paper in half, then in half again so that they have four parts to draw a story.

"This will be a story of a scrap of paper you found on the way to school. On this side (indicate left) start the story. Draw when you first see the paper. Then draw what happens next and next and next. The last picture will be on this side (indicate right). When you are finished bring it up to me so I can write about your story."

As you talk with the children about their stories, praise them if they picked up the paper and disposed of it properly in their story.

Source: **Adapted** from: Coon, Herbert L and Mary Lynne Bowman. 1976. Environmental Education in the Urban Setting: Rationale and Teaching Activities. ERIC Centre for Science , Mathematics, and Environmental Education; Columbus, Ohio. p. 66

EEACTNO: I-2-G **Level:** K-3 **Recommended Subject:** Science; Social Studies

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Purpose: To discover what trash is and how to manage it.

Reference: Junglas, Mary. Environmental Learning Experiences for Kindergarten Through Second Grade. Centre for the Development of Environmental Curriculum, Willoughby-Eastlake City Schools; Willoughby, Ohio. (ED 092 389)

Activity: Collect the trash which accumulates in the classroom after one day. Help the students separate it into three categories: **Recyclables**, **Biodegradables**, and **Disposables**.

Recyclables

Discuss some ways that this material can be reused. Sandwich bags can be used more than one time; cola bottles can be returned to the store; papers of various types can be reprocessed and reused.

Call the Recycling Council of Manitoba for a complete list of accepted recyclable products.

Biodegradables

These are materials that will decay over a short period of time (e.g. apple cores, orange peels, bread crusts, etc.).

In a plot on the school yard, bury some samples of biodegradable trash; unearth this trash periodically to see what is happening. You might also bring some paper, glass or metal trash at the same time for comparison.

Discuss compost piles and organic fertilizers.

Disposables

This is trash that will not decay and cannot be recycled.

Is there some recyclable material that could have been substituted for disposable material?

Discuss the local disposal system. What will happen to this trash?

Source: **Adapted** from: Bowman, Mary Lynne and Herbert L. Coon. April, 1978. Recycling: Activities for the Classroom. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 7

EEACTNO: I-3-R **Level:** K-3 **Recommended Subject:** Science; Social Studies

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Purpose: To start an aluminum can or plastic soft drink bottle recycling drive.

Reference: From a concept developed by the Council on the Environment of New York City, 51 Chambers Street, New York, NY 10007

Activity: Hold up aluminum cans and plastic soft drink bottles, and ask the class -- what should I do with these empty containers? Do they have to become garbage? Discuss that garbage has to be put somewhere and we will not always have many places to dump it. Since each person produces about five pounds of garbage per day, in the future, people may have to live on or near old garbage dumps.

One way to help our environment is to reuse or recycle products rather than toss them away. For example, aluminum is worth money when it is recycled. Since there is only a limited supply of aluminum ore in the earth, collecting aluminum cans for recycling is one way students can share in helping the environment.

To stage an aluminum/plastic recycling drive:

1. Ask permission to involve the class/school in an aluminum recycling drive from school administrators.

2. Contact the:

   Recycling Council of Manitoba
   (204) **OR** 257-3891

   Manitoba Soft Drink Recycling Inc.
   (204) 694-5352

   for assistance in coordinating an event in your area, and a list of accepted items at the depot.

3. Solicit the aid of the custodial staff to help find a place to store items received.

4. Ask the Parent Association or other teachers if they would help run the program.

5. Publicize the school recycling drive with posters placed around the school, flyers sent home to parents with children and/or distributed to residents of the immediate neighborhood.

6. Initiate a competition between classes in the school, to see which one brings in the most material!

Source: **Adapted** from: Coon, Herbert L and Mary Lynne Bowman. 1976. Environmental Education in the Urban Setting: Rationale and Teaching Activities. ERIC Centre for Science , Mathematics, and Environmental Education; Columbus, Ohio. p. 83

EEACTNO: I-4-HW **Level:** K-3 **Recommended Subject:** Health; Science

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Purpose: To identify terms associated with hazardous materials

Reference: Purin, Gina ed. 1984. Toxics in My Home? You Bet! Curriculum on Household Toxics for Grades K-3. Golden Empire Health Planning Centre; Sacramento, CA. p. 6-7. (ED 266 948)

Activity: Provide a copy of the worksheet on the following page to each student. Tell them that they are going to talk about some words and what they mean.

Read each clue aloud. After reading each clue, read the 'words to use'. Then ask for the answer.

Assist children in finding the answers by providing hints or by reading only those words left after each clue is answered.

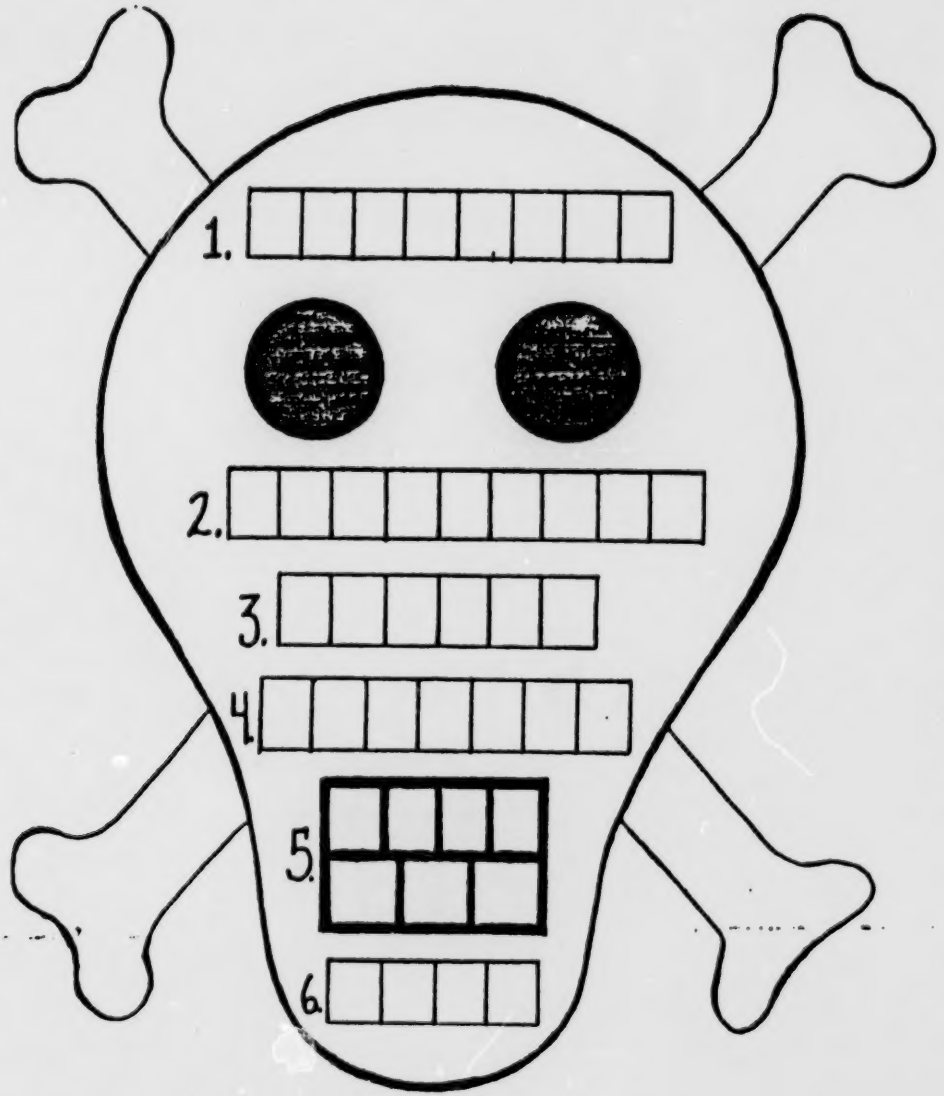
Words to Use:

Children, dangerous, poison, warning, keep out, safe.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 3-4

WORKSHEET

H-HW



Word Puzzle

CLUES

1. Boys and girls.
2. Could hurt you, means "not safe".
3. Something that can make you very sick.
4. Means "watch out" or "be careful".
5. Stay away.
6. Okay, will not hurt you.

WORDS TO USE

warning	keep out	poison
children	dangerous	safe

EEACTNO: I-5-HW **Level:** K-3 **Recommended Subject:** Science; Health

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Purpose: To demonstrate that common household products must be safely used and stored, or they will present threats to health.

Reference: Purin, Gina ed. 1984. Toxics in My Home? You Bet! Curriculum on Household Toxics for Grades 4-6. Golden Empire Health Planning Centre; Sacramento, CA. pp. 40-45. (ED 266 949)

Materials:
-coloring pages (I5-HW Figures 1,2,3)
-crayons
-construction paper or plain white sheets of 21 X 28 cm paper (for covers)

Activity: Hand out colouring pages to each child. Each page of the colouring book should be discussed and the information on the page read orally, with pages coloured later or at home.

Figure 1. Discuss what is safe and what is dangerous for the baby to eat in the kitchen. Ask the children how the baby might get hurt by the household cleaners (e.g. the baby might be thirsty and drink the bleach and get sick, etc.).

Have the children put an X on the cleaners. Discuss ways to keep the baby away from the cleaners (e.g. lock the cupboard doors, put cleaners on a high shelf, etc.).

Figure 2. Discuss how weed and bug sprays are poisons and can make people and pets sick (e.g. children playing around gardens being sprayed might get sprayed themselves and get sick. Animals might get sick when they eat weeds and grass containing pesticide residues).

There are directions on all poisons that tell how the product should be used. The directions should be followed very carefully. Read the information on this colouring page orally. Colour.

Figure 3. Discuss how products kept in the bathroom are not safe to eat (e.g. some children think things are safe to eat and drink if they look pretty or smell good. Some poisons look pretty and smell good and could make us very sick if we eat or drink them. We should never eat or drink something unless we are sure of what it is).

Ask for suggestions on keeping bathroom supplies away from small children. Read the information orally. Colour.

On a large sheet of manila or construction paper, students can design their own colouring book cover using construction or 21 X 28 cm plain paper. Have the children pick a theme for the cover such as "Safety in the Home".

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 12 -13.

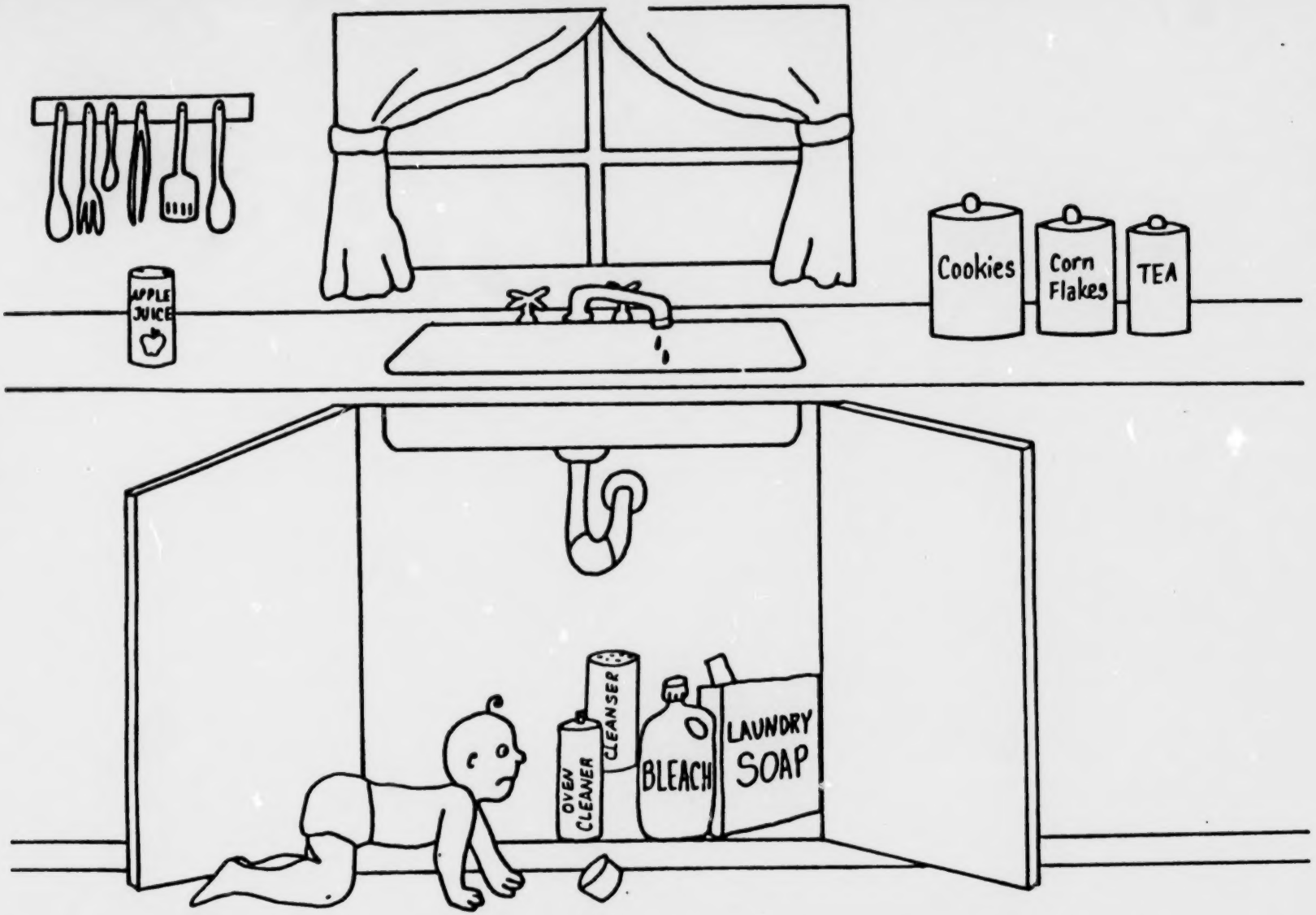

FIGURE 1

15-HW

Put an X on household products the baby should not eat.
Lock cupboards. Keep children away from dangerous products.

FIGURE 2

15-HW

Weed poison is dangerous. Stay away from poisoned areas.
Put an X on the weed killer.

FIGURE 3
15-HW

Keep all bathroom products out of the reach of children.
Put an X on the products that the baby can reach.

EEACTNO: II-1-G **Level:** 4-6 **Recommended Subject:** Language; Social Studies; Art

Purpose: To use creativity in expression to communicate ideas to others.

Reference: Original

Materials:
-poster board
-magic markers
-glue
-string
-rulers

Activity: Through class brainstorming, develop a number of slogans about recycling or household hazardous waste.

Have students print slogans in large letters on the big poster boards and then create a picture/drawing (original or pasted collages) to accompany the slogan. Each person should make two posters, so they may be strung together and worn 'sandwich style' in an assembly or 'parade' around the school to spread environmental messages to the crowd!

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 131

EEACTNO: II-2-G **Level:** 4-6 **Recommended Subject:** Math; Social Studies; Health & Safety

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Purpose: To discuss the necessity of a garbage dump in the community

Reference: Adapted from Lib Roller. Using the School and Community. Nashville Metro Schools Environmental Education Department, Nashville, TN. Title III ESEA.

Activity: Often a garbage dump is put near a community. Why is the dump necessary? (e.g. trash must be put somewhere)

What are some of the things you don't like about it? (e.g. eyesore, dirty, dangerous if children play in or near it, air pollution from burning, attract pests like sea gulls, bears, rats, etc.)

If the dump was not there, where would we put our garbage?

What do you and your family do with your garbage? Do you know where it goes?

Source: Coon, Herbert L and Mary Lynne Bowman. 1976. Environmental Education in the Urban Setting: Rationale and Teaching Activities. ERIC Centre for Science , Mathematics, and Environmental Education; Columbus, Ohio. pp.114-115

EEACTNO: II-3-G **Level:** 4-6 **Recommended Subject:** Social Studies; Science

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Purpose: To examine an environmental problem and help students formulate courses of action toward solutions for the problem.

Reference: Adapted from Charles T. Vizzini, Project Director. Valuing the Environment-Secondary. Charlotte-Mecklenburg Environmental Education Project, Charlotte, NC. June, 1975. ED 134 449.

Activity: Divide your class into groups of four or five children. Assign each group a specific area on your school grounds and/or surrounding community to look for litter. Ask each group to either list or collect examples and as a group to decide whether or not litter is a problem in their assigned area.

Have each group share their findings with the rest of the class. Hold a discussion on what makes something a problem.

What criteria did the groups use to decide whether litter was a problem in their areas? Compare and contrast the specific group areas. Were some areas considered to have more of a litter problem than others? Are there certain environments that people tend to litter more than others? Ask your class to offer realistic solutions to the problem litter areas. After they have explored possible solutions, give each student the a 'litter ballot' and ask them to 'vote' (following page) on each answer.

Once the votes have been cast and counted, report the results. Is there any conflict between what students see as a problem, propose as solutions, and action they say they would be willing to take?

Source: Bowman, Mary Lynne. December, 1979. Values Activities In Environmental Education. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. pp. 42-43

LITTER BALLOT

1. I believe I should pick up litter I see even though I did not drop it.

   _____ yes _____ no

2. I believe I should tell anyone I see littering to stop and pick up their litter.

   _____ yes _____ no

3. It makes no difference to me whether people litter or not.

   _____ yes _____ no

4. I would be willing to pay out of my own money for someone else to pick up litter.

   _____ yes _____ no

5. I believe I should report a litterer to authorities.

   _____ yes _____ no

6. I would be willing to pay out of my own money for authorities to catch and punish litterers.

   _____ yes _____ no

EEACTNO: II-4-R **Level:** 4-6 **Recommended Subject:** Science; Art

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Purpose: To recycle paper.

Reference: Printed (in source) with the permission of: Environmental Action Coalition, 235 E. 49th Street, New York, NY

Activity: Ask your students to speculate how much paper they use in one day (e.g. napkins, lunch bags, school work, paper towels, packaging, paper cups, newspaper, etc.). What would life be like without these products? At this time, there are enough trees to make all of these paper products but we might not always have an abundant supply. Used paper products can be made into usable paper. This is called recycling.

1. **Materials needed to recycle your own paper:**

   -bucket or large bowl
   -egg beater
   -newspaper
   -piece of window screen about 10 cm square
   -instant starch (this is not necessary but will make paper stronger)
   -two or three used pieces of paper

2. Tear the paper into very small pieces. Put the small pieces into the bowl.

3. Fill the bowl with water. It is best to use warm water, if possible. If you want to use starch, dissolve two teaspoons in cold water first and then add it to the bowl with the paper.

4. Let the paper soak in the water for at least 10 minutes. Then beat it with the egg beater until it becomes soft and mushy. This is called 'pulp'.

5. Dip the screen into the bowl carefully, tilting it so the edge goes in first. Then lift the screen up flat, letting the pulp cover the screen.

6. Let the water drip back into the bowl.

7. Turn the screen upside down on the newspaper. This has to be done carefully so the pulp doesn't all come apart.

8. Slowly and carefully take off the screen. Don't move the pulp! The pulp should stay on the newspaper.

9. Leave the pulp on the newspaper until it dries. When it is dry, you will have recycled paper!

10. Slowly take the recycled paper off the newspaper.

Of course your recycled paper is much thicker and rougher than the same paper made at a paper mill. This is because paper mills have many complicated machines to make the paper smooth and flat.

Source: Coon, Herbert L and Mary Lynne Bowman. 1976. Environmental Education in the Urban Setting: Rationale and Teaching Activities. ERIC Centre for Science , Mathematics, and Environmental Education; Columbus, Ohio. pp. 121-122

EEACTNO: II-5-HW **Level:** 4-6 **Recommended Subject:** Science; Health

---

Purpose: To develop an understanding that unsafe disposal of household toxic substances may have harmful effects on health and on the environment.

Reference: Purin, Gina ed. 1984. Toxics in My Home? You Bet! Curriculum on Household Toxics for Grades 4-6. Golden Empire Health Planning Centre; Sacramento, CA. pp. 27 - 43. (ED 266 949)

Activity:

1. Pass out "Routes to the Environment I and II" sheets (II5-HW Figure 1, 2) to each student. Introduce the various methods of household toxic disposal which have been available in the past:

   a. dumping toxics in the trash
   b. washing toxics down the drain
   c. throwing toxics on the land
   d. incinerating toxics

   To facilitate discussion, pass out a copy of the handout Household Waste: Available Disposal Means (II5-HW Figure 3). Discuss the various options given.

2. Using Figures 1 and 2, have each student visually trace each method of disposal. Each student may colour-code each disposal route by tracing methods with coloured pencils/crayons.

3. As these routes are being established visually, have the students pay attention to where products go after leaving the house. For example, when something is thrown down a sink drain (Figure 1), it goes to a septic tank or treatment plant and then into a waterway. Discuss the possible damaging effects each method can have on the environment or health. The following are examples:

   a. Trash goes to landfills/dumps. Refuse workers have been injured when collecting trash containing toxic chemicals. Workers at the landfill can also be injured.

   b. Substances dumped in household toilets or drains (e.g. sinks and tubs) go directly into the sewers or septic tanks. The sewer systems may lead to rivers or sewage treatment plants. The sewage treatment plants, as well as septic tanks, are not designed to handle many hazardous wastes. Also large amounts of hazardous wastes may kill the living organisms in the treatment plant and septic tanks. These living organisms feed off the conventional waste (bacteria, fecal matter, etc.), thereby treating it before it is discharged to a body of water or on land. If the organisms are killed, both hazardous wastes and conventional pollutants can enter our waterways.

   c. Wastes dumped in storm drains may lead directly to local waterways.

   d. Wastes dumped on weeds or in holes in the ground leach into the soil, eventually contaminating ground water.

   e. Burning toxic waste can pollute the air which we breathe.

It is extremely dangerous to burn products in aerosol cans which can explode under pressure.

4. Ask the class if they can think of any safe disposal methods for household toxic substances. Allow time for responses. Some responses might include 'Make sure the product is all used up before throwing it in the trash' or 'Maybe a neighbor could use it'. If students suggest the latter, be sure they realize that it may not always be wise to give away all potentially toxic materials. If they are given to people who don't handle them responsibly by following the instructions, the toxics can damage people or hurt our environment.

There is growing interest and enthusiasm for community-based disposal depots for household hazardous wastes. When the toxics have been collected from the public (generally at a pre-designated collection site on a given day or days), they are packaged and transported ultimately, to a facility designed to dispose of hazardous wastes. To find out if your community is involved in a collection depot, contact your civic or municipal council and/or the Manitoba Hazardous Waste Management Corporation.

6. Ask the students that if all of the citizens and communities of Manitoba did not practice safe methods of toxic waste disposal, what would happen in the long term? How should these problems be handled? What can you do to get people involved?

7. Conclude that we must be careful about the potentially toxic substances we buy. We should try to use up all of the products that we buy. We also could consider buying products that are less toxic than others.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 30 - 35

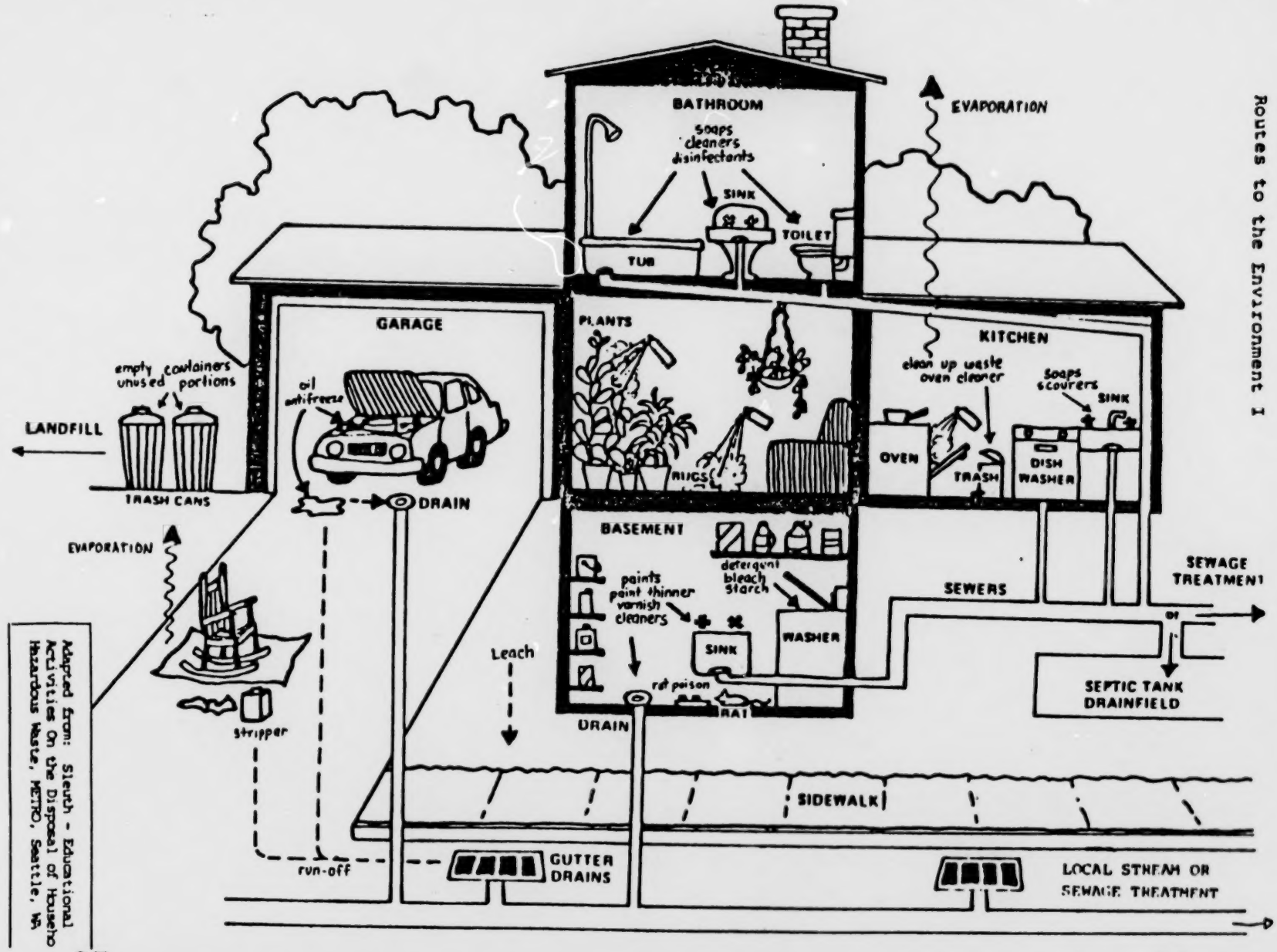

FIGURE 1

Adapted from: Sleuth - Educational Activities On the Disposal of Household Hazardous Waste, METRO, Seattle, WA

115-HW

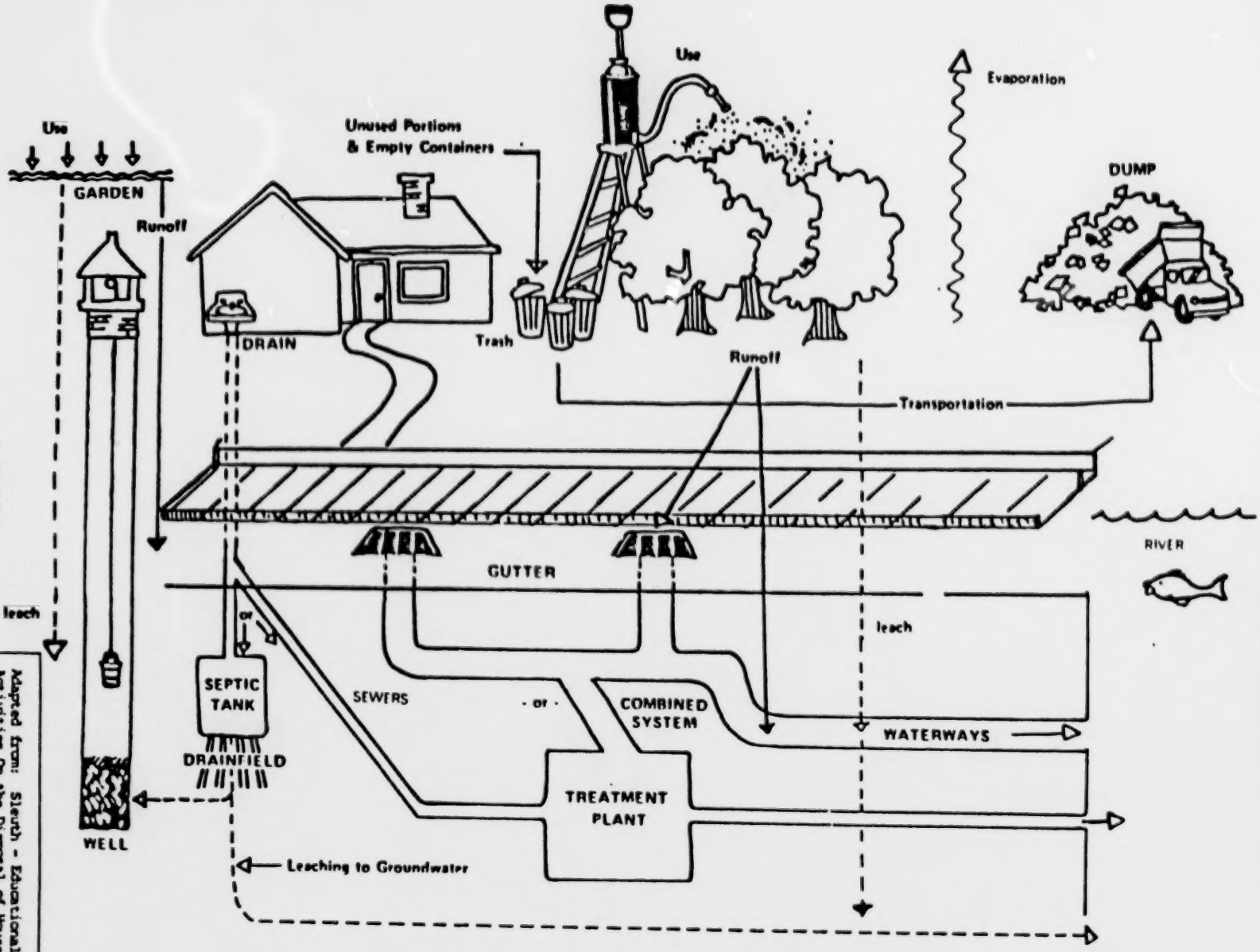

FIGURE 2

Adapted from: Sleuth - Educational Activities On the Disposal of Household Hazardous Waste, METRO, Seattle, WA

115-HW

FIGURE 3

115-HW

Adapted from: Sleuth - Educational Activities on the Disposal of Household Hazardous Waste, METRO, Seattle, WA

EEACTNO: II-6-A **Level:** 4-6 **Recommended Subject:** Social Studies

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Purpose: To demonstrate what happens to complex messages as they are passed from person to person.

Reference: Original

Materials: -portable tape recorder

Activity: Select six people from the class to be participants, while the rest are observers. The six are sent out of earshot of the leader and main group.

Recorded on tape, the teacher brings back one of the youngsters and explains to him the details of a local environmental issue. The teacher then brings a second youngster back and asks the first youngster to pass the message/story along. This and all subsequent 'conversations' will also be recorded. This format continues until the sixth youngster has been told the story.

The leader then plays back the original explanation and the sixth. The whole group then discusses what has happened to the context of the story..

How does this affect getting environmental messages to people?

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 143

EEACTNO: III-1-G **Level:** 7-9 **Recommended Subject:** Science; Social Studies

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Purpose: To help the student develop awareness and concern about solid waste disposal problems in the community.

Reference: Centre for the Development of Environmental Curriculum. (ED 099 230)

Materials:
-paper and pencil
-transportation
-waste collection schedule for homes and businesses (e.g. available from civic or municipal offices and/or private garbage haulers)

Activity: Using the garbage and trash disposal schedule, determine dates of collection in areas of the community you wish to study. Make a route-of-investigation schedule for the purpose of arranging visits throughout the community (or have the students present a descriptive narrative of their neighborhood).

Divide the class into groups, to deal with the following questions:

1. What is the average number of cans or bags of garbage per street?
2. What kind of solid wastes are observable?
3. At what location on each parcel of land is the rubbish placed for pickup?
4. How well does the rubbish appear to be packaged?
5. How are waste materials dealt with at places of business and industry?
6. What is the appearance of the general area of the community on the day of collection?
7. What kinds of vehicles are used to place waste for pick-up?
8. Who are the sanitary engineers, and what are their job responsibilities?
9. What is the noise level during pick-up and transfer?
10. What is the neatness level after pick-up and transfer?
11. Where is the waste material taken and how is it finally disposed of?

Record information on data sheets and then have the group meet to discuss what they have discovered.

Make a list of recommendations that might improve any problem areas and present or direct it to elected officials in the community.

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 75

EEACTNO: III-2-HW **Level:** 7-9 **Recommended Subject:** Science; Social Studies; Health

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Purpose: To inventory the types of household products in the home which are potentially toxic or hazardous.

Reference: For Scientific Toxicity Ratings of Household Products (next page): Adapted from R.E. Gosselin et al. 1976. Clinical Toxicology of Commercial Products. 4th Ed. Williams & Wilkins; Baltimore, MD.

Activity:

1. For a take-home assignment, have students inventory the many types of dangerous household products they find, by completing **all but the Scientific Toxicity Rating column** on Household Products Inventory Form (next page). It is important that the parents participate in the exercise and provide answers for the toxicity rating too.

2. When students complete the home assignment, provide them with the answers to the Scientific Toxicity Rating column.

3. Initiate a discussion with the class, using for example, some of the following ideas:

   A. Select some interesting items and compare the toxicity ratings from different sources. Who tended to have higher ratings: you, your parents, or the scientists? On what kinds of items were these ratings most similar? or the most different?

   B. What kinds of items were found the most frequently by the class?

   C. For these frequently found items, what disposal options are usually used? Do they seem appropriate? What are the recommended disposal options?

   D. For the most toxic items, what disposal options are usually used? Do they seem appropriate? What are the recommended disposal options for each?

   E. Are there adequate disposal options available in your community?

Source: **Adapted** from: The Federation of Ontario Naturalists. 1985. Hazardous Waste In Ontario. Section One. pp. 60-64

Household Products Inventory Instructions

1. Students are to use a 'check mark' to indicate the items on the list that they find:

   -indicate the approximate quantity of each item;
   -indicate the condition of the container by a 'check mark' if it is OK or an 'X' if it is leaking, rusted, or otherwise unsafe;
   -find out from the 'owner' if it is going to be used or thrown out; and,
   -if it is going to be thrown out, use the following **Disposal Code Numbers** to indicate how it will be likely disposed of.

   Disposal Code Numbers:

   1 = use up; place empty container in garbage can
   2 = garbage can
   3 = toilet or inside drain
   4 = storm sewer
   5 = yard or garden
   6 = bury
   7 = direct to municipal dump
   8 = recycling centre
   9 = hazardous waste collection depot

2. When students return to class, have them complete the inventory form by filling the **Scientific Toxicity Rating** column.

   Toxic Rating Scale:

   1 = practically non-toxic
   2 = moderately toxic
   3 = extremely toxic

Source: The Federation of Ontario Naturalists. 1985. Hazardous Waste In Ontario. Section One. pp. 60 - 64

Household Products Inventory

	How Much	Container Condition	Toxicity Rating You	Parents	Sc	Will It Get Used	Disposal Codes
Garage or Basement:							
____ waste auto oil							
____ gasoline							
____ old antifreeze							
____ used brake or transmission fluid							
____ old batteries							
____ cans of old paint							
____ stains or preservatives							
____ solvents, turpentine							
____ paint strippers							
____ rat poison							
____ insecticides (kill bugs)							
____ herbicides (kill weeds)							
____ slug bait							
House:							
____ pet flea collars							
____ flea sprays							
____ furniture polish							
Kitchen/Bathroom:							
____ drain cleaners							
____ abrasive cleaners							
____ household disinfectants							
____ deodorizers							
Laundry Room:							
____ detergent							
____ dry cleaning fluids							
____ spot removers							
____ bleach							

Scientific Toxicity Ratings of Household Products

Toxicity Rating Scale	Toxicity Rating Descriptive	Household Product Examples
1	Practically Non-Toxic	'lead' pencils, eye makeup
2	Slightly Toxic	Dry cell batteries, glass cleaner, deodorants, anti-perspirants, hand soap
	Moderately toxic	Antifreeze, automotive cleaners, household bleaches, many detergents, dry cleaners, most floor cleaners, metal cleaners, most oven cleaners, many general cleaners, most fuels, lubricating oils, most stain and spot removers, many disinfectants, floor polish, shoe polish, most paints.
3	Very toxic	Most toilet bowl cleaners, some deodorizers, engine motor cleaners, some fertilizers, some paint and varnish removers, fireworks, air sanitizers, some paints, lacquer thinner, some paint brush cleaners, many pesticides: DDT, chlordane, diazinon, malathion, 2,4-D, etc.
	Extremely toxic	Mercury cell battery, some fertilizers, some insecticides, fungicides, rodenticides, herbicides
	Super toxic	Certain pesticides such as paroxon, phosdrin, parathion, etc.

Source: **Adapted** from: The Federation of Ontario Naturalists. 1985. Hazardous Waste In Ontario. Section One p. 62, citing adaptation from R.E. Gosselin et al. 1976. Clinical Toxicology of Commercial Products. 4th Ed. Williams & Wilkins; Baltimore, MD.

EEACTNO: III-3-HW **Level:** 7-9 **Recommended Subject:** Science

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Purpose: Reading Household Cleaner Labels

Reference: Original

Activity:

I. Using the attached 'sample' label (III3-HW Figure 1), have the students in your class answer the following questions, orally or in worksheet form:

1. What is the brand name of this product?
2. What is this product used for?
3. How does this product work?
4. What are the active ingredients of this product?
5. How should this product be used or applied? (List all pertinent irections.)
6. Are there application precautions given?
7. Sometimes active ingredients are indicated as a % of the total weight/volume of the product:
   Math teaser:
   a. What is the total weight/volume of the product?
   b. List the % of each ingredient in question 4
   c. Compute the equivalent weight/volume of each ingredient listed.
8. How much product is used per application?
9. How long would it take to use up the entire box or bottle?
10. Are there any effects to human health or the environment which would result from use of this product?
11. What suggestions, if any, are given for disposal of the container?
12. Do you know of any alternatives to use instead of this product?

II. Following this exercise, ask students to look at the labels of household products they find at home and repeat the exercise by filling in a blank worksheet. Ask students to do this exercise with their parents, not only for safety precautions but also to educate!

III. Organize a field trip to a local grocer or hardware store to survey the shelves for toxic or hazardous substances, or alternatively, inventory the school's warehouse, custodial supply area or cafeteria for potential hazardous substances.

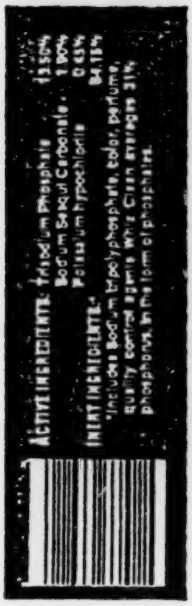
Later, list the items you saw, and initiate a discussion about proper disposal of dangerous products.

Source: **Adapted** from: Municipality of Metropolitan Seattle. August, 1982. SLEUTH. Educational Activities on the Disposal of Household Hazardous Waste. Metro Toxicant Program Report No. 1D. Water Quality Division. pp. 125, 128-129, 159.

WORKSHEET: Reading Labels. . . .Household Cleaners Name_____

Bleaches out food stains
Cleans and Disinfects

USE WHIZ CLEAN ANYWHERE IN YOUR HOME



KITCHENS

Sinks: Whiz Clean cleans and whitens porcelain, cleans stainless steel to a sparkle.

Countertops, Plastic Surfaces: Whiz Clean bleaches through food, beverage, ink stains. Wet, sprinkle Whiz Clean, let soak for a while, then rub only as needed, rinse. Do not soak for prulonged periods.

Pots & Pans, Stoves, Ceramic Cookware: Whiz Clean cuts grease, scours off cooked-on food.

BATHROOMS

Sinks, Tubs, and Showers: Whiz Clean disinfects as it cleans.

Ceramic Tile, Fixtures: Whiz Clean cleans to a sparkle.

Toilet Bowls: Whiz Clean cleans and sanitizes. Sprinkle Whiz Clean liberally into bowl, scour and flush.

Vanity Tops, Plastic Fixtures: Special care should be taken in cleaning these surfaces. Let Whiz Clean work a minute or so with plenty of water. Rub gently if needed, and rinse.

FOR TOUGH JOBS: For easiest results, let Whiz Clean work with water a minute or so, then rub as needed and rinse.

Other Uses: Whiz Clean cleans away soil and stains on cement floors, garbage cans, auto chrome, whitewall tires, outdoor grills. . .

FIGURE 1

III3-HW

EEACTNO: III-4-HW **Level:** 7-9 **Recommended Subject:** Science

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Purpose: To identify common sources of hazardous wastes.

Reference: Assaff, Edith. 1984. Hazardous Wastes: The Consumer Connection. Western Michigan University; Kalamazoo. pp. 9-10

Activity: On the following pages, Table 1 and Figure 1 provide information concerning relative amounts of hazardous wastes generated by industrial and manufacturing processes in the United States.

Using this information as a starting point only, identify examples of each **waste stream in your own community**.

This activity may be extended by seeking quantitative information from local industries.

If you choose to seek such information, ask industries to provide information about how they seek to solve their hazardous and toxic waste disposal problems.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 88-89

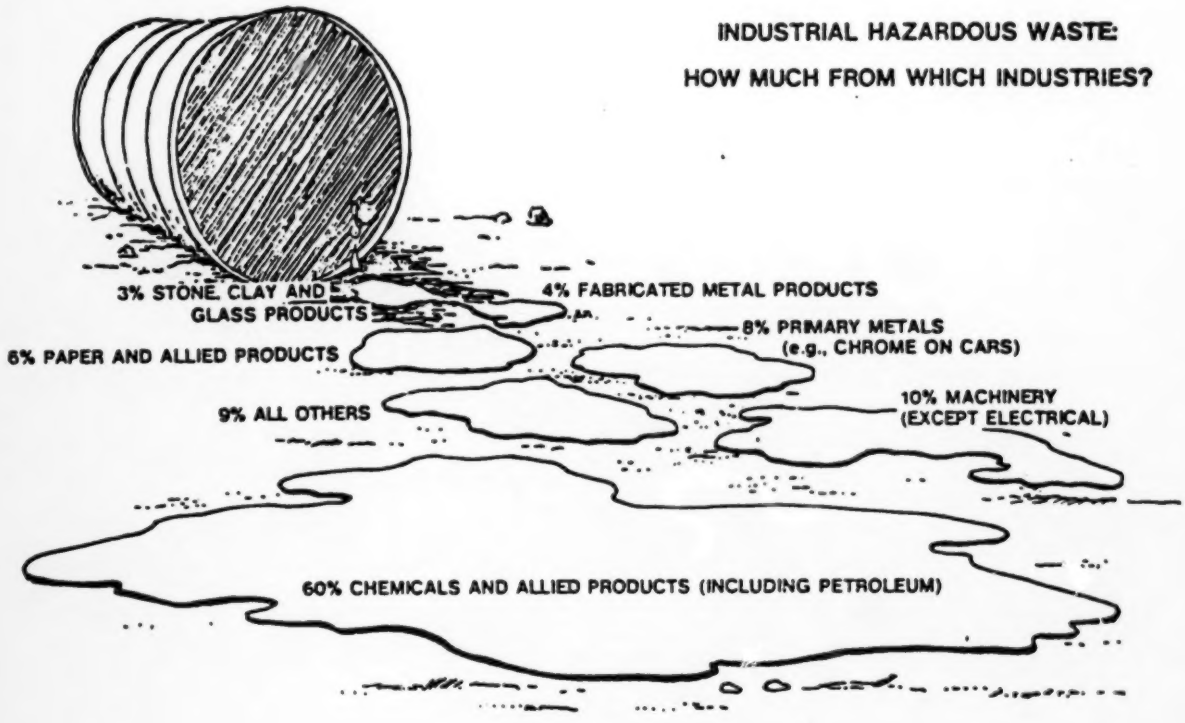
WHERE HAZARDOUS WASTES COME FROM

Industry	Million Metric Tons in 1977
Batteries	0.164
Inorganic Chemicals	3.900
Organic Chemicals, Pesticides and Explosives	11.666
Electroplating	4.053
Paint and Allied Products	0.110
Petroleum Refining	1.841
Pharmaceuticals	0.074
Primary Metals Smelting and Refining	8.973
Textiles Dyeing and Finishing	1.870
Leather Tanning	0.143
Special Machinery	0.153
Electronic Components	0.078
Rubber and Plastics	0.944
Waste Oil Re-refining	0.074
Total	34.043

SOURCE: Environmental Protection Agency

TABLE 1

III4-HW


INDUSTRIAL HAZARDOUS WASTE:
HOW MUCH FROM WHICH INDUSTRIES?
3% STONE, CLAY AND GLASS PRODUCTS
4% FABRICATED METAL PRODUCTS
8% PRIMARY METALS (e.g., CHROME ON CARS)
6% PAPER AND ALLIED PRODUCTS
9% ALL OTHERS
10% MACHINERY (EXCEPT ELECTRICAL)
60% CHEMICALS AND ALLIED PRODUCTS (INCLUDING PETROLEUM)

Percent of Total Hazardous Waste in the United States
(Source: EPA, 1979)

FIGURE 1

III4-HW

EEACTNO: III-5-A **Level:** 7-9 **Recommended Subject:** Language Arts; Social Studies

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Purpose: The 'Opinionnaire' can be a widely used survey vehicle designed to determine what peoples' opinions are on a particular question or issue. This technique will help your class identify differing values toward environmental issues, develop skills in recording and communicating data, make inferences based on the data and recommendations based on data and ecological principles.

Reference: Original

Activity:

1. Divide your class into groups of 4 or 5 students.

2. The model 'Opinionnaire' on the accompanying page, may be modified by your students. In general, an opinionnaire should be designed according to the following:

   A. Carefully decide the information to be collected.
   B. Specify a geographic area in which data are to be collected.
   C. Collect enough data to make sure the information is truly representative of the problem in question. A minimum of 25 persons per sample is recommended.
   D. Record all data carefully and completely.
   E. Work out a system that will accurately communicate the data to others (e.g. charts, graphs, tables).
   F. Make sure that all conclusions, inferences and recommendations are substantiated by the data collected.

3. The opinionnaire on the accompanying page is designed to collect citizen's opinions and concerns about hazardous waste. It is suggested that samples be taken from different segments of the population (e.g. junior high students, high school students, parents, grandparents, neighbors, etc.). Have students read the opinionnaire to the persons being surveyed.

4. Have each group make a summary sheet to tally the results of their opinionnaire, using a different sheed for each age group:

	Yes	No	Undecided	Male	Females
Question 1					
Question 2					
Question 3					
etc ...					

5. Following the opinionnaire exercise, initiate a classroom discussion considering the following questions:

   A. Are those values expressed by citizens consistent across the populations which were sampled? Why is this the case, or why not?

   B. Do you believe that different opinions should be shaped concerning hazardous waste in your community?

   C. If a hazardous waste problem exists in your community, what recommendations could you pose for helping resolve the problem? Do you believe this problem could be solved with one single action or a combination of actions?

   D. What do you think Manitoba should do about the hazardous waste problem?

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. pp. 83-86

Model Opinionnaire

Introduction: Hello, my name is _____. I am a student in grade _____ at _____ school. We are collection information about how people feel about (household) hazardous wastes.

General Data:

Sex: M:___ F:___ Age: ___ Jr. High ___ Sr. High

Questions:

Y	N	U		
___	___	___	1.	Do you consider hazardous waste to be a problem in this community?
___	___	___	2.	In your opinion, does hazardous waste have any ill effects on the beauty or aesthetic quality of this community?
___	___	___	3.	Do hazardous wastes have any public health impact on the community?
___	___	___	4.	In your opinion, would hazardous waste clean-up cost this community much money?
			5.	In which of the following places in the community do you think hazardous wastes are generated: _____ schools _____ households _____ hospitals _____ businesses _____ industry
			6.	Which of the following sources of hazardous waste are responsible for the greatest amount of hazardous waste? The least? Rank the following hazardous waste generators from largest to smallest: _____ schools _____ households _____ hospitals _____ businesses _____ industry
			7.	Which of the following statements concerning the regulation of hazardous wastes do you agree with? _____ The province of Manitoba should not actively enforce the regulation of hazardous wastes. _____ The province of Manitoba should enforce the regulation of hazardous wastes only in extreme or severe cases. _____ The province of Manitoba should enforce the regulation of hazardous wastes to the letter of the law. _____ The province of Manitoba should construct a facility to properly treat and dispose of hazardous wastes.
___	___	___	8.	If you saw someone 'dumping' hazardous waste, would you consider reporting it to authorities?
___	___	___	9.	Do you think that people should become more responsible for the safe disposal of hazardous wastes?
			10.	What do you think the biggest hazardous waste issue is today?

Record Answer:

_____

_____

EEACTNO: III-6-R **Level:** 7-9 **Recommended Subject:** Science; Social Studies

Purpose: To have the students examine the issue of recycling containers.

Reference: Les Solomon. Bottle Bill Activities for the Classroom.

Action: This activity consists of flowchart production and interview collection.

1. Flowcharts show the steps needed to accomplish a task. They are a helpful tool to visualize our ideas. Have teams of students prepare flowcharts to illustrate their solutions to one or more of the following problems:

   A. Construct a flowchart to illustrate the history of the pop bottle from the point of raw material extraction to final disposal of the bottle.

   B. Demonstrate what happens to both a returnable and non-returnable bottle from the point of manufacture to disposal.

   C. Illustrate the important decisions made by a shopper choosing a returnable or non-returnable soft drink container in a grocery store.

   Different groups will have different ways of solving these problems. Have groups share their process(es) and their solution(s). The group may wish to consider some of these questions:

   -What are the most important decisions to be made with respect to recycling?

   -Why will one person decide to take bottles to a recycling centre while a neighbor will throw them away?

   -Why do many retailers object to the recycling possibility?

   -Is the dump really the end of the process?

2. Following activity (1.), the groups may want to survey a variety of people -- consumers, retailers, bottling plant workers, landfill operators, etc. -- to collect their viewpoints of the disposable container issue (see the 'Opinionnaire' Activity).

   Have groups present their findings to the rest of the class.

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. pp. 99-100

EEACTNO: III-7-R **Level:** 7-9 **Recommended Subject:** Science; Social Studies

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Purpose: To examine the idea of recycling used motor oil.

Reference: McEwen, L.B. Jr. "Re-refining of Waste Lubrication Oil: Federal Perspective." Resource Recovery and Energy Review. 3(6):14-17, November/December, 1976.

Activity: When oil is changed at a service station, the used oil is sometimes stored and picked up for re-refining.

There are also many automobile owners who save more than 50% of the cost of an oil change by buying oil at a store and changing it themselves. However, in these situations, the used oil seldom gets recycled. It likely gets thrown away in the garbage, is burned or dumped into storm sewers or on the ground.

1. Engage the class in surveying their families, to determine if they personally change the oil in their motor vehicles or prefer to have this done in a service station or garage.

   If the oil change is made at home, have the students ask what is done with the waste oil? Does this person think that these disposal practices are damaging to the environment in any way?

2. Prior to class discussion in (1.), have several volunteers check with some service stations in your area to see what is done with the used oil they collect. Is it worth anything? Do they have suggestions about what should be done with the few quarts of used motor oil collected by the car owner who prefers to 'change his/her own'? Use these suggestions in the class discussion.

3. Discuss similarities and differences in points of view held by class members, their parents, and service station operators. Is recycling of motor oil really important enough to worry about?

Source: **Adapted** from: Bowman, Mary Lynne and Herbert L. Coon. April, 1978. Recycling: Activities for the Classroom. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 120

EEACTNO: III-8-A **Level:** 7-9 **Recommended Subject:** Social Studies; Science; Language

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Purpose: To recognize conflicting viewpoints on toxic waste management and disposal practices, and to identify safe and unsafe practices.

Reference: Purin, Gina ed. 1984. Toxics in My Home? You Bet! Curriculum on Household Toxics for Grades 9 - 12. Golden Empire Health Planning Centre; Sacramento, CA. pp. 48-64 (ED 266 951)

Activity: Issues relating to toxic substances are generally controversial because there is no clear proof on how certain substances will react once they are in the environment, and what reactions will occur when they are mixed with other substances. Some people argue that there is proof that many substances should be taken off the marketplace or be better regulated. Others believe that this is not true and that chemicals should be considered innocent until proven guilty. What do you think? Allow time for discussion.

Distribute copies of the worksheet on the following page. Instruct the class to read the worksheets and choose five issue areas. Direct them to provide a written response to Side A or Side B of each issue area they choose. Following the written assignment, allow for open discussion of the issue areas in class. Students who chose Side A can debate their responses with students who addressed the same issue area but chose to respond to Side B.

Students should also write why they chose Side A over Side B (or vice versa) and what additional information they would like to possess that might support their position.

Tell the students that disposal of hazardous waste is often costly but the price of cleaning up the environment from indiscriminate disposal practices is far greater. The cost to human health can not be given a cost figure.

Ask "How can we safely dispose of hazardous wastes?" Allow students time to respond. Accept all reasonable answers.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 157 - 158

WORKSHEET

III-8-A

Issue Topics

Choose five of the following issue areas. After choosing an issue area, pick Side A or Side B to discuss. On a separate sheet of paper, write why you chose that position and what additional information, if any, you would want that might support your position.

1. Side A. Health and safety data on any chemical should be available for any member of the public who cares to look at it.

   Side B. Manufacturers should be allowed to keep health and safety data secret.

2. Side A. Chemical companies should pay for health and safety tests of their chemicals.

   Side B. Health and safety tests should be financed by public funds.

3. Side A. We should try to limit our consumption of synthetic products -- for example, nylon and plastic -- that tend to generate toxic or hazardous wastes during their manufacture.

   Side B. We should take full advantage of the benefits of modern technology and enjoy all products, hoping that a safe means for disposal of all toxic wastes will be developed at some point.

4. Side A. We should ship our hazardous wastes to other countries if they are willing to receive them.

   Side B. We should not ship our hazardous wastes to other countries in lieu of finding safe technology for their disposal.

5. Side A. The ocean is large and resilient, an ideal place for diluting hazardous wastes, and should not be used for dumping.

   Side B. Ocean dumping of hazarous wastes should not be used.

6. Side A. The provincial government should be able to determine where hazardous waste treatment facilities should be located.

   Side B. Local communities should be able to determine whether or not they want a hazardous waste disposal facility in their community.

7. Side A. Household quantities of wastes are small enough that they should not be regulated like industrial wastes.

   Side B. Household quantities of toxic substances should be regulated the same as industrial quantities. The same chemicals used by households are used by industries who manufacture or use the product.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 157 - 158

EEACTNO: IV-1-HW **Level:** 10-12 **Recommended Subject:** Language Arts

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Purpose: Through this exercise, students will research and:

1. define hazardous waste; list four major categories of household hazardous waste, seven categories of industrial waste (see Introduction to Kit, Table 1) and examples of each; and, identify sources of hazardous waste; and,

2. identify federal and provincial government officials responsible for enacting laws, enforcing compliance and the disposal of hazardous waste.

Reference: Original

Activity:

A. Initiate the activity by discussing that the process of becoming an informed citizen involves:

-defining the issue
-learning the terminology
-identifying the problems
-identifying responsible agencies

B. Explain to students that they will be using communication skills to become informed citizens on the subject of hazardous waste.

Hand out copies of the MHWMC Corporate, Generator Services and What are Household Hazardous Waste brochures, and view the videotape Who's Responsible?

You may also want to display a collection of reports and papers regarding the issue of hazardous waste in Manitoba, and encourage students to use this information as well.

C. The assignment is for students to list and define categories of hazardous waste and give an industrial and household example of each.

The students will also be responsible for reasonable definitions of the following terms often associated with hazardous waste issues:

-NIMBY	-generator
-compliance	-pollute
-environment	-MHWMC
-PCB	-ppm/ppb
-4 R's	-site selection

D. With the students, use results of the assignment to define hazardous waste, list categories of hazardous waste and compile examples of each.

E. Discuss the definitions of the terminology exercise.

F. How does the issue of hazardous waste management impact your community? Ask students to create a thematic display for the classroom, using newspaper or magazine articles, pamphlets, labels, etc.

G. What is your community doing/planning to do about hazardous waste issues in the area?

Invite a civic/municipal council member to meet with your class, and/or invite representatives from the regulatory agency or provincial Crown corporation responsible for the establishment of a hazardous waste treatment facility in Manitoba.

Source: **Adapted** from: Tennessee Valley Authority, Waste Management Program and Environmental/Energy Education Program of the Office of Natural Resources and Economic Development. n.d. Waste: A Hidden Resource. Tennessee Valley Authority, Citizen Action Office; Knoxville, Tennessee. pp. 145 - 147

EEACTNO: IV-2-HW **Level:** 10 - 12 **Recommended Subject:** Science

Purpose: To observe groundwater contamination, using a model landfill.

Activity: I. Background:

Reference: Llewellyn, Gerald C., et al. 1985. The Dilemma of Toxic Materials, Classroom-Tested Ideas and Resources for Social Studies and Science Teachers. Virginia Commonwealth University; Richmond, VA. pp. 215-221. (ED 263 015)

Hazardous wastes can result from mining, farming or industrial processes in addition to everyone's home. Without proper disposal, these waste products can contaminate the groundwater. It is the purpose of this lesson to show how toxic pollution can result from uncontained disposal sites.

There is serious concern about the purity of water supplies for domestic and industrial use. It is virtually impossible to find any natural body of water that has not been affected by man-made pollutants or through the manifestation of man's activities, such as irresponsible disposal or illegal/accidental dumping.

Ground water is precipitation that has percolated through porous earth and collected in layers of rock, sand, and gravel called aquifers, which may be only a few inches or several miles deep. Groundwater may move very slowly and not cleanse itself as well as previously thought.

A secure landfill for **treated** hazardous waste is more sophistocated than a sanitary landfill. It is a highly engineered site using proven technological procedures and techniques to provide total containment of hazardous materials, thus protecting surface and ground water from contamination. Usually built in thick, impermeable clay soils and/or using synthetic materials for reinforcement, they are typically constructed in cells. Wells are drilled surrounding the site for continual monitoring of groundwater for leachate.

II. Exercise:

Reference: Taylor, Carla ed. 1985. Groundwater: A Vital Resource, Student Activities. Tennessee Valley Authority Knoxville, TN. pp. 53-55 (ED 262 970) (Experiment has been modified.)

This activity demonstrates how precipitation on a sanitary landfill can leach chemicals into the groundwater, contaminating wells, ponds and streams.

Hand out worksheet (IV2-HW) on municipal contamination for students to read.

1. Using an old aquarium, prepare sand as indicated in IV2-HW Figure 1, using these tips as a guide:

   -place aluminum foil under the sand but overlapping the bowl trap so that the 'contaminated water' (coloured by red food dye)that 'leaches from the landfill will flow into the clean water below
   -the aluminum foil forms a trough (like an aquifer) from the landfill to the reservoir below
   -place the landfill higher than the water reservoir
   -place the bits of paper in the landfill before pouring the water

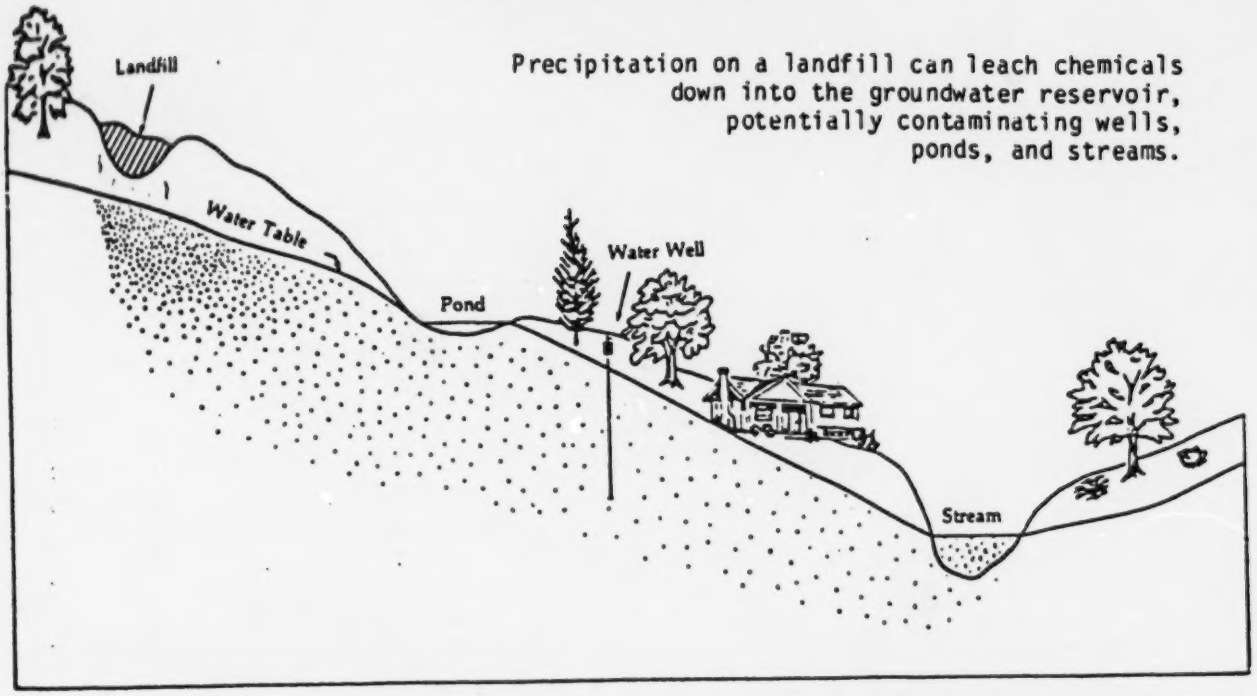
-stress that the landfill material could be here for years before it actually contaminates the water below

2. Demonstrate contamination of groundwater by pouring water on side without the 'landfill' **first**, and then repeating the exercise on the side with the 'landfill'.

3. Discuss your observations.

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 161 - 163; 225 - 230

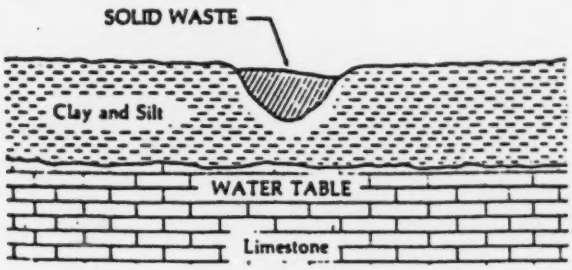
MUNICIPAL WASTE CONTAMINATION



Precipitation on a landfill can leach chemicals down into the groundwater reservoir, potentially contaminating wells, ponds, and streams.

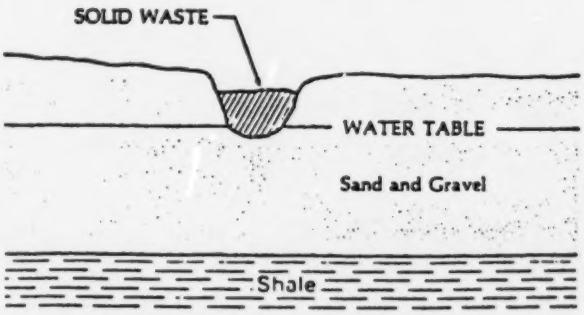
In the humid areas of the country, rain and snow on a landfill may carry dissolved substances downward, delivering biologic, organic, and inorganic pollutants to the groundwater. The degree of hazard depends on the geology of the site, design of the landfill, and character of the wastes.

Most municipal trash is disposed of in such landfills. Other important sources of municipal contamination include sewage effluent, sludge disposal, and leaky sewers.



Relatively Safe

Pollutants move slowly in clay and silt and many noxious compounds are absorbed on clay-mineral grains.



Unsafe

Pollutants entrained directly in groundwater.

(Illustrations from USGS Circular 601-F)

WORKSHEET

IV2-HW

HOW PRECIPITATION OVER LANDFILL CAN
CONTAMINATE GROUNDWATER

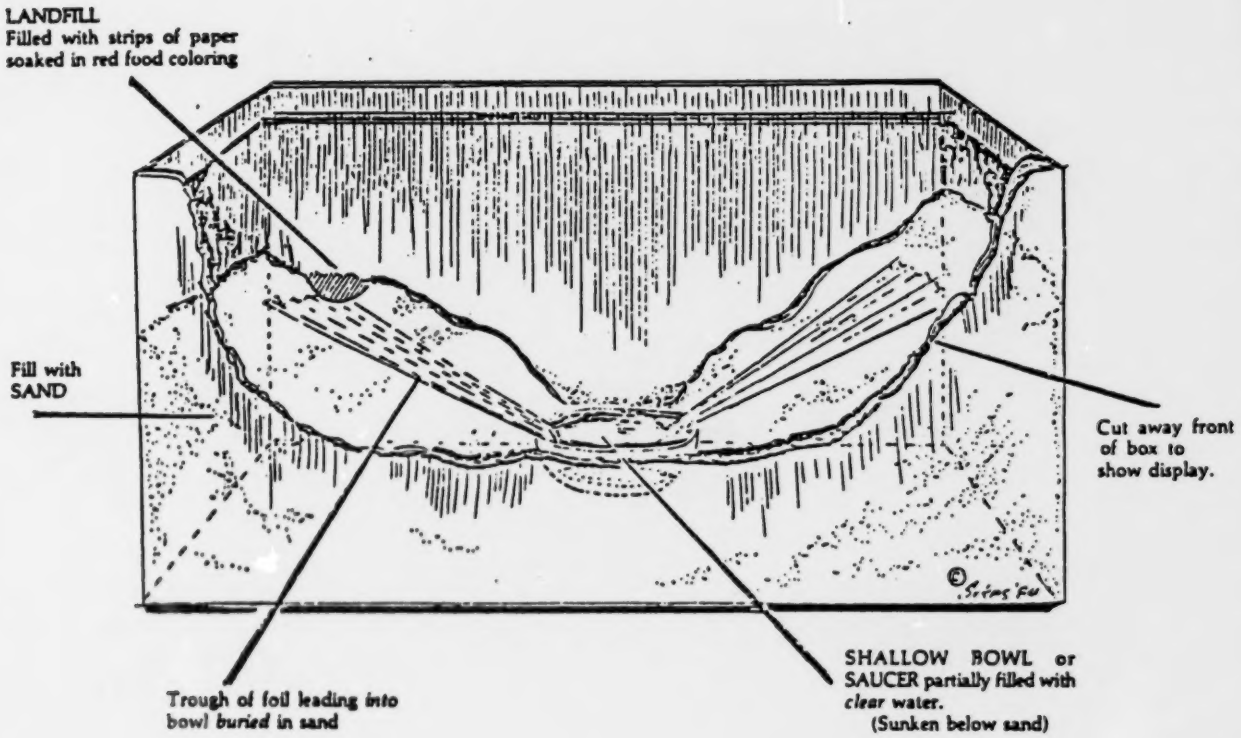

LANDFILL
Filled with strips of paper soaked in red food coloring
Fill with SAND
Cut away front of box to show display.
Trough of foil leading into bowl *buried* in sand
SHALLOW BOWL or SAUCER partially filled with *clear* water.
(Sunken below sand)

FIGURE 1

IV2-HW

EEACTNO: IV-3-HW **Level:** 10 - 12 **Recommended Subject:** Social Studies; Biology; Chemistry

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Purpose: To determine strategies and solutions for disposing of hazardous waste.

Reference: Iozzi, Louis A., et al. 1980. Environmental Dilemmas: Critical Decisions for Society, Student Guide, Preparing for Tomorrow's World. Rutgers University Centre for Coastal and Environmental Studies; New Brunswick, NJ. p. 93 (ED 230 373)

Activity: The Dilemma -- A hypothetical situation in the United States

Robert Hughes became concerned about the dumping of industrial chemical waste into deep wells close to the major river in his area. He began searching for a more environmentally safe way to dispose of these wastes. Together with a soil researcher, he developed a biodegrading technique that used soil to break down chemicals into safe compounds. He then formed a company, purchased 2500 hectares of land and secured a contract with a chemical company to haul away and dispose of its toxic wastes.

Soon after he began hauling the chemical waste to the disposal site, the state enacted new rules for the storage and disposal of hazardous chemicals. The new rules required that companies handling hazardous chemicals obtain a license for $5,000 and post a $200,000 cash bond. Mr. Hughes did not have such a large sum of money. Moreover, it turned out that the chemicals were so highly toxic that a much more expensive technique was required to detoxify the materials. Under these new conditions the company could not operate.

Mr. Hughes now had 2,500,000 litres of very poisonous chemicals in metal drums standing in the middle of the desert. Since he did not have a license to dispose of the waste by his new 'soil' method, the state ordered him to bury the waste in underground trenches within one week. The state claimed that it was safe to bury the waste. Mr. Hughes however, was sure that the chemicals would leak into and poison underground fresh water reservoirs.

Should Mr. Hughes comply with the state orders? Why or why not?

Discussion Questions

-In terms of society's welfare, which would be worse: disobeying the law or burying a chemical in a way that might be harmful? Why?
-Since Mr. Hughes owns the land, shouldn't he be allowed to do what he wanted on it? Why or why not?
-If the chemicals should leak into the fresh water reservoirs, who should be blamed? The chemical company? Mr. Hughes? The state? Why?
-Isn't the state trying to protect people from unsafe disposal of chemical waste by imposing such a law? Why or why not?
-If Mr. Hughes was so concerned about toxic chemical waste, shouldn't he try to raise money for a license? Why or why not?
-Since Mr. Hughes' intentions are good, do you think that the state should consider allowing him to operate without paying for a license and a bond? What would people think about laws if the state made an exception for Mr. Hughes and allowed him to operate without a licence? Why?
-If a person takes on a responsibility should he/she try his/her best to complete it, no matter how difficult? Why or why not?
-If Mr. Hughes defies the state order, should he be sentenced to jail? Why or why not? What effect would that have on society?

Source: **Adapted** from: Disinger, John F. and Marylin Lisowski. December, 1985. Teaching about Hazardous and Toxic Materials. Environmental Education Information Report. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, OH. pp. 254 - 255

EEACTNO: IV-4-HW/R **Level:** 10-12 **Recommended Subject:** Language Arts

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Purpose: To actively involve a student group in a hazardous waste collection and/or recycling depot.

Reference: A Supplementary Program for Environmental Education: Language Arts, Grade 11. Project I-C-E. Green Bay, Wisconsin, Title III, ESEA. (ED 055 919)

Activity:

1. Contact municipal officials to determine if and when a recycling or hazardous waste collection depot is scheduled for your area.

2. Ask students think of examples of items which are collected at Manitoba recycling depots and/or Community-Sponsored Household Hazardous Waste Collection Depots.

3. Through the school or regional library, the Manitoba Recycling Council or Manitoba Hazardous Waste Management Corporation, obtain literature describing materials accepted at recycling and/or waste depots.

4. Assign classroom committees responsible for:

   A. writing factual handout sheets on recycling and hazardous waste collection depots and indicating the date, location and time of the depot(s) scheduled for your area; and,

   B. writing articles which contain much of the information in (A.) for local or regional newspapers.

   Solicit the local or regional newspapers for sponsorship of a short student article.

5. Check with the city/community council, the Manitoba Recycling Council and/or Manitoba Hazardous Waste Management Corporation for ideas which could be used to increased community impact.

   When the school administration and/or sponsoring agencies have approved the publicity materials, distribute them throughout the community, either in mailboxes of neighborhood homes, or in local stores, village boards or other public buildings.

6. Encourage students and their families to participate in the depot(s). Plan a participant competition between classrooms.

Source: **Adapted** from: Bowman, Mary Lynne and Herbert L. Coon. April, 1978. Recycling: Activities for the Classroom. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 133

EEACTNO: IV-5-A **Level:** 10-12 **Recommended Subject:** Social Studies; Science

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Purpose: This activity is about personal and community priorities. Economic concerns often influence the action people take as individuals and as groups. Skills developed in the activity are: the identification of consequences and causal relationships, identification of similarities as well as differences between personal and community priorities, and determining appropriate actions which would influence others.

Reference: Elardo and Cooper. Developing Social Living Behavior.

Activity: Have each student read the situation below and identify what he/she would do if faced with such a situation. Encourage students to be as creative yet realistic as possible in their choice of actions.

Situation:

A profitable industry wants to locate in a small town because a river running on the outskirts of the town would be an 'easy and inexpensive' way to dispose of industrial waste. The town has many poor people who would be willing to work for just about any wage. The industry would be a boon to the town and increase its economic standing in the province.

You have been invited to attend the town council meeting and voice your opinion about the location of the industry. You are aware of the possible pollution of the river which currently provides clean drinking water, a site for recreational activities, and homes for many animals, fish and waterfowl. However, you also realize that the industry would provide better incomes for many poor families and increase the standard of living for the community. You are personally acquainted with poor families who desperately want the industry and opportunities it will bring.

N.B. The class should debate these issues with one team for the industry and one against it. Following the debate, a moderator (the teacher) could help the class decide the best, long-term solution or compromise for the entire town.

Questions for Students to Consider:

1. Will you take a stand for or against the new industry at the council meeting?
2. Consider the cost of losing the river as a source for drinking water, recreational activity and wildlife refuge, in addition to the expense of cleaning it up after it has been polluted.
3. List arguments you will use to help persuade fellow citizens to see your point of view.
4. Consider the plight of the poor in the community.
5. Will your relationship with any of your friends be affected by your decision?
6. How will you feel toward those who oppose you?
7. Is there any possibility of a compromise situation?
8. How can the community reach a concensus on the issue?

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. pp. 132-133

EEACTNO: IV-6-A **Level:** 10-12 **Recommended Subject:** Social Studies

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Purpose: To simulate the problems involved in group decision-making.

Reference: All Around You - An Environmental Study Guide, Bureau of Land Management, United States Department of the Interior, Washington, DC

Activity: Present the following problems to your class:

1. An industry in town is putting out great quantities of black smoke as a result of the burning of its waste products. The town is located in a valley which means the smoke is not easily blown away. A group in town has formed to stop pollution of the air. This group is complaining to the town council about the smoke problem.

   The industry says it cannot afford to change its method of waste disposal. Other people in town oppose the control of the smoke because they feel it will discourage industry from moving to their town. They say it would prevent economic development.

2. Divide the class into the following groups: **Town Council, industry representatives**, a **Citizens for Environmental Quality committee**, and a **Citizens for Economic Development committee** (see descriptions below).

   Each group should meet and discuss what it wants the town council to do about the problem, and what the group thinks is needed to make this a better place to live. **The ideas should be based upon some research into the problem, not just personal opinion.** Elect a spokesman for each group to present its 'case' to the Town Council when the class meets as a whole again.

3. The Town Council should elect one of its members to be in charge of the meeting. After listening to the representatives from the different organizations the Town Council should come up with a list of priorities: a list of what it is going to act upon first, second, etc.

4. Your class may wish to invite a member of the real town council to come and discuss the ideas following the 'meeting'.

   Group Descriptions:

   Town Council. This is the town's governing body which will decide whether the smoke pollution will be stopped. The purpose of the other groups is to persuade this council through their representatives, that their position is correct.

   Industry Representatives. This group represents the industry which is causing the smoke pollution. Naturally, they are concerned with their interests and want to keep their profits at a maximum. However, they are interested in public opinion and may respond to public pressure. The group claims that their economic development will be harmed if strong controls on smoke emissions become law.

   Citizens for Environmental Quality. This group is determined to solve environmental quality problems as soon as possible. Its members believe that a clean environment is more important than a profitable industry in town. The group

also believes that the waste product being burned could be put to valuable use. Most people in this group do not depend on the industry for their jobs.

Citizens for Economic Development. This group is composed of businessmen and also people who work for the industry causing the smoke pollution. They are siding with the industrial group since they are concerned with the town's economy. However, this group realizes that environmental quality is important and might seek a slow, gradual solution to the problem so that the industry is not hurt.

Source: **Adapted** from: Coon, Herbert L and Mary Lynne Bowman. 1976. Environmental Education in the Urban Setting: Rationale and Teaching Activities. ERIC Centre for Science , Mathematics, and Environmental Education; Columbus, Ohio. pp. 136-137

EEACTNO: IV-7-A **Level:** 10-12 **Recommended Subject:** Social Studies

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Purpose: To enable students to discover that effective decision-making involves consideration of alternatives and various trade-offs.

Reference: Stapp and Cox. Environmental Education Activities Manual -- Junior High Activities. (ED 119 948)

Materials:
-pencils and paper
-telephone and telephone directories
-outside speakers
-guide to local government agencies

Activity:

1. Select an issue of local environmental concern that has been or is currently being covered by local newspapers, radio, or television (e.g. the siting of a hazardous waste treatment facility in Manitoba).

   Divide the class into teams to seek out information from not only the media but government agencies, local libraries (e.g magazine articles), citizen groups, businesses and industries.

   The length of this issue-investigating activity is flexible and can take a few days to several weeks if letters are written. Set a reasonable deadline.

2. After each group has selected a specific information source to investigate, discuss the following handy tips to help each group investigation their 'source'. Remember to indicate that whenever students speak with someone about the issue, to ask them if they know of other people or groups worth contacting.

   Suggest that students use an outline so that they have all the main points they are interested in discussing in front of them.

   A. Print media. When looking for information in a newspaper or magazine, be critical. That is, be aware that some written articles can be biased towards certain groups of people: rural, urban, businessmen, political parties, etc.

   B. Write letters if time permits. Ask for specific information from the person or group you are writing. This makes it easier for them to give you relevant information by a particular time.

   C. Personal interviews. You can usually get the best information this way. Allow yourself to be flexible and open-minded when you speak with someone. Remember to be a patient and polite listener.

   D. Ask your teacher to arrange a fieldtrip if the issue is being considered in a local meeting, such as a city council meeting or public hearing.

   E. Audio/Visual media coverage. Contact local radio and television stations to see if they have a reporter(s) who is covering on the issue.

3. As groups obtain information, compile a data sheet for students to record the names of contacts and make brief statements about the information they have obtained.

4. After the investigative work is complete, outline on a large chart or blackboard the perspectives on the issue the groups have obtained.

5. Have the group evaluate each alternative, the consequences and trade-offs if any (costs vs. benefits) and collectively, decide upon the best alternative(s) to resolve the issue (a ballot vote can be useful here).

   The class may then wish to write the local editor, or appropriate government agencies, to express views and rationale or, bring in outside speakers to present their viewpoints to the group.

6. Review the exercise with the class in a debriefing:

   -What sources of information were explored? ignored?
   -What groups have the most power in making a decision on the issue?
   -Did you have an opinion on the issue before the investigation?
   -Did it change as a result of the investigation?
   -Do you feel the issue is being considered fairly in the community, by viewing all alternatives and the consequences of each alternative?

Source: **Adapted** from: Roth, Charles E. and Linda G. Lockwood. December, 1979. Strategies and Activities for Using Local Communities as Environmental Education Sites. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. pp. 150-151

EEACTNO: IV-8-C/HW **Level:** 10-12 **Recommended Subject:** Social Studies; Science

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Purpose: To investigate the variety of careers related to recycling and hazardous waste management, and the type of training needed.

Reference: Giebelhausen, Maribeth R. et al. Trash -- Our Only Growing Resource. Missouri State Department of Education, Jefferson City, Missouri; Parkway School District, Chesterfield, MI. 1973. Title III, ESEA. (ED 098 070)

Activity:

1. Ask your class to help you list jobs related to recycling. Your students will probably come up with a few of the obvious ones such as running a recycling centre and landfill operators and supervisors.

2. Point out that many career opportunities exist related to these growth industries, including for example:

   -advertising
   -natural resource managers
   -urban planners
   -engineers
   -chemists
   -biologists
   -marketing specialists
   -lab technicians
   -plant managers
   -truck drivers
   -heavy equipment operators
   -security personnel
   -analysts

3. Discuss each of these jobs and how they relate to recycling and hazardous waste management.

   Invite your guidance councillor or representatives of the Recycling Association of Manitoba, the Department of Environment Workplace Safety and Health, or Manitoba Hazardous Waste Management Corporation to come and discuss the types of training necessary for careers in these fields.

Source: **Adapted** from: Bowman, Mary Lynne and Herbert L. Coon. April, 1978. Recycling: Activities for the Classroom. ERIC Clearinghouse for Science, Mathematics and Environmental Education; Columbus, Ohio. p. 121

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Tennessee Valley Authority, Waste Management Program and Environmental/Energy Education Program of the Office of Natural Resources and Economic Development. n.d. Waste: A Hidden Resource. Tennessee Valley Authority, Citizen Action Office; Knoxville, TN. pp. 145-147.

Resource Kit Evaluation Sheet

Please write your comments in the space provided:

1. To what extent have you made use of this resource kit during the school year?

2. Were the activities suitable for the grade level indicated?

3. Can you suggest ways in which the activities can be improved or made more interesting?

4. Can you suggest other activities that could be used in the Hazardous Waste Environmental Education Kit?

Thank you for your time.

Please return this evaluation to:

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